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An innovative cladding panel connection for RC precast buildings

Emanuele Del Monte[1] · **Cesare Falsini**[2] · **Sonia Boschi**[1] · **Giovanni Menichini**[1] · **Maurizio Orlando**[1]

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Abstract
Recent Italian earthquakes highlighted some critical issues of mechanical devices usually utilized to fasten reinforced concrete cladding panels to precast structures. These devices were often designed to uncouple the displacements of cladding panels and the frame structure. Unfortunately, during the last earthquakes, the cladding-to-structure connections did not perform as expected, and in most cases, they failed causing the overturning of cladding panels. The paper presents results of a wide experimental campaign on both commercial and innovative mechanical cladding-to-structure connections, both for vertical and horizontal panels. Tests were performed in the Structures and Materials Testing Laboratory of the Department of Civil and Environmental Engineering of Florence, where a specific and original setup was designed to perform dynamic cyclic tests, under different load conditions. Commercial connections showed a hysteretic behaviour until the collapse, due to the flexural failure of the strap or to the failure of the anchor channel fixed to beams or columns and the expulsion of the hammer-head screws. Proposed innovative connections, especially those used for vertical panels, proved to be able to uncouple in-plane horizontal displacements of panels and the structure, as expected in their design. Moreover, no significant damage was detected in these connections during tests, as friction forces were very low.

Keywords Precast cladding panels · Industrial precast buildings · Experimental tests · Connections · Anchor channels

1 Introduction

RC precast buildings represent a considerable part of the commercial and industrial buildings in European countries. They are generally characterized by high deformability under horizontal loads, which means high lateral displacements during earthquakes; the ultimate drift ratio, defined as the drift ratio at which a reduction in load resistance by 20% after the peak load is observed, can reach 8% (Fischinger et al. 2008) (e.g.

✉ Maurizio Orlando
maurizio.orlando@unifi.it

[1] DICEA, University of Florence, Via di Santa Marta 3, 50139 Florence, Italy

[2] Baraclit S.p.A, Loc. Pianacci 19, 52011 Bibbiena, AR, Italy